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S Y N O P S I S
OF THE
PLANISPHERE OF THE EARTH,
AND OF
THE MAP OF EUROPE,

In which the Situation and Extent of the Primary Divisions of the *Globe*, and the *Empires, Kingdoms, States, and Republicks of EUROPE*, with their Number, Boundaries, Extent, Degrees of Latitude, &c. in the *aggregate* and *separately*, are obtained by Inspection;

TOGETHER WITH THE
DESCRIPTION AND USE OF THE GLOBES.

INTENDED, BY THE AUTHOR, AS A USEFUL APPENDIX
TO HER
INTRODUCTION TO GEOGRAPHY AND ASTRONOMY.

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A D V E R T I S E M E N T.

THE very favourable reception which my *Introduction to Geography and Astronomy, for the Use of Young Ladies*, has obtained from the Public, has induced me to add whatever else I imagined could make it further beneficial, or render either of the Sciences therein treated, of still easier attainment. With this view, I have added the *present* Synopsis to my former endeavours, for the benefit of the young student in Geography, together with the Use of the Globes. In the former, the learner will find a very encouraging degree of knowledge of the Planisphere of the Earth, contained in a few lines; and the several Empires, Kingdoms, States, and Republicks of Europe, comprised in a few more. This (and indeed all the other parts of this Appendix) it is intended the

Students



students should get by heart, and repeat as a Lecture, with the *Planisphere, and Map of Europe* before them; shewing or pointing out, with an index, the several situations, degrees of latitude, parts, and divisions of each.

To this Lecture succeeds a brief and specific account of the several kingdoms of Europe, &c. *separately*, with their extent in statute miles, boundaries, capitals, and chief towns, with the latitude and longitude of each ; by which the learner will immediately become acquainted with the several particulars at sight, and be able to point them out with exactness ; and only for the more minute and diffuse accounts, have occasion to have recourse to the book itself.

The Use of the Globes is introduced in the usual manner, but as concisely as was consistent with *perspicuity*, and *necessary information*; first describing the *Globe*, and its several *parts*; and then shewing their *use*, and application. In these Lectures many things will occur, which to those who have read the book itself, will appear like repetition, but the Use of the Globes being a different and distinct science

from

from *Astronomy*, though connected with it, must have all its several parts noticed and illustrated, though already mentioned in another science; and along with *this*, another consideration rendered this minuteness still farther necessary, viz. that being a *subsequent* work, it may (and doubtless will) fall into the hands of many, who have not seen the *first*.

To these two Lectures on the Globes, succeed thirteen Problems ; and in those I have confined myself to such as are most *useful*, or *entertaining*. I have purposely avoided all such Problems as may be termed *abstruse*, because they are, in my opinion, not only *unnecessary*, but *unfit* for Ladies ; on this account I have wholly omitted those Problems which require the Celestial Sphere, as I do not see of what use, ornament, or advantage it can be to a Lady, to know how to find the Sun's Azimuth ; or to find at what hour, any known star passes the meridian, &c. &c.

But however this may meet the Public opinion, as it is my wish, so it is my hope, that this little Synopsis will be found, to give an eligible degree of general knowledge to those who do not choose to attend to

longer

longer investigations, and be a very advantageous
assistant to those who do.

It is only necessary to observe further, that ~~the~~
Globes I suppose to be used, are the New Patent
Globes of Mr. ADAMS.

INTRODUCTION

I N T R O D U C T I O N
TO THE
SYNOPSIS OF THE PLANISPHERE
OF THE
E A R T H.

Q. **W**HAT is the form of the Earth?

A. The form of the Earth is spherical.

Q. Has the Earth any motion?

A. Yes, the Earth has *two* distinct motions.

Q. What are those motions?

A. The Earth has a *centrifugal* motion round its own *centre* or *axis*, on which it revolves once in 24 hours, by which we have the vicissitude of day and night; and also a *progressive* motion round the Sun, which it completes in 365 days 5 hours and 49 minutes.

Q. What are the *poles* of the Earth?

A. They are the two extreme points of the Earth's *axis*; the N. point of which is called the N. Pole, and is the centre of the *northern* Hemisphere; and the S. point, the S. Pole, which is the centre of the *southern* Hemisphere.

B

Q. What

Q. What is the Earth's *axis*?

A. The right line which passes through that point which is the Earth's centre from one pole to the other, connecting them together, is the Earth's *diameter*; but as the Earth turns once round upon it in 24 hours, it becomes its *axis*.

Q. What are the proper circles of the *terrestrial sphere*?

A. They are eight, four *greater* and four *lesser* circles.

Q. Which are the greater circles of the sphere?

A. The four greater are, the *Equator*, the *Meridian*, the rational *Horizon*, and the *Ecliptic*.

Q. Which are the four lesser circles?

A. The two *Tropics* and the two *polar Circles*.

Q. Are there any other circles of the sphere?

A. There are the two *colures*; but they properly belong to the celestial sphere.

Q. What is the *Equator*?

A. The Equator is a *great circle* of the sphere, which divides the earth into two equal parts, called the *northern* and *southern Hemispheres*; it is equidistant from either pole, being 90 degrees from each.

Q. What is the *Meridian*?

A. The Meridian is a great circle of the sphere, crossing the equator at right angles, and passing through both the poles; there are innumerable meridians; for, as a ray from the Sun's centre becomes, by the earth's diurnal motion, perpendicular to every point of the earth's surface in succession, every one of those points consequently has its *meridian*.

Q. What is the *rational Horizon*?

A. The

A. The *rational* Horizon is a great circle of the sphere, dividing the earth into two equal parts, called the visible and invisible Hemispheres.

Q. Is there any other than the *rational* Horizon ?

A. Yes, the *sensible* Horizon, or that circle which, in a prospect, bounds our view, where the earth and sky seem to meet. The plane of the former, or *rational* Horizon, passes through the earth's centre, the plane of the latter, touches the earth's surface.

Q. What is the *Ecliptic* ?

A. The *Ecliptic* is a great circle (properly of the celestial sphere) which cuts the *equator* obliquely in the two opposite points of *Aries* ♈ and *Libra* ♎, making an angle with it of $23\frac{1}{2}$ degrees, and is consequently half on the N. and half on the S. side of the *equator*.

Q. How is the *Ecliptic* divided ?

A. The *Ecliptic* is divided into 12 *signs*, or spaces, each sign containing 30 degrees ; 12 times 30 being 360, the number of degrees in all circles.

Q. Name those signs ?

A. *Aries* ♈ the Ram ; *Taurus* ♉ the Bull ; *Gemini* ♊ the Twins ; *Cancer* ♋ the Crab ; *Leo* ♌ the Lion ; *Virgo* ♍ the Virgin ; *Libra* ♎ the Balance ; *Scorpio* ♏ the Scorpion ; *Sagittarius* ♐ the Bowman ; *Capricornus* ♑ the Goat ; *Aquarius* ♒ the Water-bearer ; *Pisces* ♓ the Fishes.

Q. What is the situation of the two *Tropics* ?

A. They are placed one on the N. and the other on the S. side of the *equator*, parallel to it, and $23\frac{1}{2}$ degrees distant

from it; the *northern* tropic touches the ecliptic in the sign *Cancer*, from which circumstance it has its name, being on that account called the Tropic of *Cancer*, and the *southern* tropic touches the ecliptic in the sign *Capricorn*, and is thence called the Tropic of *Capricorn*.

Q. What are the *Zones*?

A. They are certain divisions of the earth, whose boundaries are parallel to the *equator*.

Q. How many *Zones* are there?

A. Five.

Q. Which are they?

A. The *torrid* Zone, the two *temperate*, and the two *frigid* Zones.

Q. What is the situation of the *torrid* Zone?

A. The *torrid* Zone comprises all that space of our earth contained between the tropic of *Cancer* and the tropic of *Capricorn*, and is in breadth 47 degrees, or twice $23\frac{1}{2}$ degrees.

Q. How are the *temperate* Zones distinguished?

A. Into the *northern* and *southern* *temperate* Zone.

Q. What is the situation of the N. *temperate* Zone?

A. It is situate on the N. side of the tropic of *Cancer*, and comprises all that space contained between the tropic above-mentioned, and the *arctic* or N. polar circle, or 43 degrees, (being the complement of a quadrant, or 90 degrees, the distance from the equator to the pole).

Q. What is the situation of the S. *temperate* Zone?

A. It is situate on the south side of the tropic of *Capricorn*, and comprises all that space contained between the *southern*

*nthern tropic and the *antarctic* or S. polar circle, or 43 degrees, as above.*

Q. How are the frigid Zones distinguished ?

A. Into the N. and S. frigid Zones.

Q. What is the situation of the N. frigid Zone ?

A. The N. frigid Zone contains all that space comprised between the *arctic*, or N. polar circle, and the N. pole ; and the S. frigid Zone in like manner contains all that space intercepted between the *antarctic*, or S. polar circle, and the S. pole ; each of the frigid zones being 47 degrees in breadth, or twice $23\frac{1}{2}$, as the torrid zone.

Q. What is the diameter of the Earth ?

A. The Earth's diameter is 7,970 miles.

Q. What is the circumference of the Earth ?

A. As the form of the Earth is *spherical*, and that every *sphere* or *circle* contains 360 degrees, the circumference of the earth is consequently such number of degrees, each containing 60 geographical miles, or 21,600 in all.

Q. Have the miles in a degree any other denomination ?

A. Yes, they are called *minutes* ; and as all circles great or small contain 360 degrees, so the 60th part of each, is a minute of such degree.

Q. What is meant by the term *Latitude* ?

A. Latitude in Geography means the distance of any place from the equator towards either pole.

Q. What is the highest degree of Latitude ?

A. As all degrees of latitude begin at the *equator* where they are *nothing*, and end at the *poles* where they are 90, the

the number 90 (or the respective pole), must necessarily be the highest degree of latitude.

Q. Have all places on the earth Latitude?

A. No; all places on the *terrestrial equator* have no latitude, because *there* all Latitude begins.

Q. What is meant by the term *Longitude*?

A. *Longitude*, means the distance of any place from a *first meridian*, measured by the degrees and minutes on the *equator*; all places *eastward*, or to the right hand of the *first meridian*, have E. longitude, and all places *westward*, or to the left hand, have W. longitude.

Q. Have all places on the globe Longitude?

A. No; all those places under the first meridian have no longitude, because *there* all Longitude begins.

LECTURE I.

ON THE PLANISPHERE, AND MAP OF EUROPE.

THE form of the Earth, as of every other planet is spherical, and consists of *land* and *water*.

The *land* is divided into *two* great or primary divisions, called the *Eastern* and *Western* Continents.

Each of these two continents are situate, partly on both sides of the *equator*.

The *Eastern* Continent, which is much the larger of the two, is divided into *three* great or primary divisions; viz. *Europe*, *Asia*, and *Africa*.

The

The *Western* Continent is divided only into two great or primary divisions, viz : *North*, and *South America*,

Europe, the first great division of the *Eastern* Continent, is situate on the *north* side of the tropic of *Cancer*, and 36 degrees from the *equator*.

Asia, which extends much farther southward than *Europe*, is notwithstanding, wholly on the *north* side of the *equator*; but part of this great division of the earth, extends far *within*, or southward of the northern tropic of *Cancer* above-mentioned; as almost the whole *hither* peninsula (called India within the *Ganges*), and the *further* peninsula (or India beyond the *Ganges*) approach, the former within *eight*, and the latter within *one* degree of the *equator*.

Africa, the third great division of the *Eastern* Continent, is situate under the *equator*, which divides this great *peninsula* nearly in two; and extends about 13 degrees north of the tropic of *Cancer*, that is, to 36 degrees N. latitude, and 10 degrees 30 minutes south of the tropic of *Capricorn*, or to 34 degrees 30 minutes S. latitude.

America, the *Western* Continent, is likewise situate under the *equator*, (or equinoctial line) and like the last-mentioned division of the world, extends far beyond both the tropics, but much farther towards the N. than to the S. as it projects more than 15 degrees within the *arctic* or north polar circle; that is, to 82 degrees 20 minutes, N. latitude; and on the south side of the *equator*, it extends 32 degrees 30 minutes beyond the tropic of *Capricorn*; that is to 56 degrees S. latitude.

MAP OF EUROPE.

Europe is situate, as mentioned above, on the north side of the *tropic of Cancer*, between 36 and 72 degrees N. latitude, and between 10 degrees W. and 65 degrees E. longitude from the meridian of London; and is about 2,400 miles in extent, from N. to S., and 2,550 from E. to W.

Europe is bounded on the N. by the *Frozen Ocean*, and the *White Sea*; by the *Mediterranean* on the S.; by the *Archipelago*, the Straits of the *Hellespont* (now called the Straits of *Dardanelles*), the *Sea of Marmora* (the ancient *Propontis*) the *Thracian Bosphorus*, or Straits of *Constantinople*, the *Euxine* or *Black Sea*, and the *Sea of Azoph*, or *Palus Maeotis*, with *Asiatic Russia*, on the E.; and by the *Atlantic*, or *Western Ocean*, on the W.

The divisions of Europe are distinguished into *Empires*, *Kingdoms*, *States*, and *Republics*.

The *Empires* of Europe are *three*, viz.

The Empire of { Germany,
 Russia,
 Turkey in Europe.

The *Kingdoms* of Europe are *thirteen*, viz.

The Kingdom of	Norway, Sweden, Denmark, Poland, Prussia, England (including Scotland and Ireland), Bohemia, Hungary, France, Spain, Portugal, Sardinia (with Savoy and Piedmont), and The Two Sicilies.
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The *State of the Church*, as it is called, or the middle division of Italy, is not mentioned with the above, though as much a *kingdom* as any other. The Pope being a *temporal*, as well as a *spiritual* prince, and crowned such with the same, and other much greater solemnities than any other sovereign on earth.

The *Republicks* of Europe are *nine*, viz. three *greater* and six *lesser* Republicks:

The three *greater* Republicks are,

The Republick of	Venice, an <i>Aristocracy</i> , Switzerland, or the Swiss Cantons, a <i>Democracy</i> , The united States of Holland, an <i>Aristocracy</i> .
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The six *lesser* Republicks are;

The Republick of

The Grisons, a *Democracy*,
 Genoa, an *Aristocracy*,
 Geneva, ditto,
 Lucca, ditto,
 Marino, a *Democracy*,
 Ragusa, an *Aristocracy*.

Besides the above, there are more than 300 petty states and sovereignties in *Italy* and *Germany*, but of two little moment to require any mention here.

LECTURE II.

ON THE SEVERAL PARTS OF EUROPE.

N O R W A Y.

Q. WHICH is the most northern kingdom of Europe?

A. Norway.

Q. How far N. does Norway extend?

A. It extends from 52 degrees 40 minutes, to 72 degrees N. latitude.

Q. What are the boundaries of Norway?

A. Norway is bounded on the N. by the *Frozen Ocean*; on the S. by the *Scaggerac*, or *Catgate Sea*; on the E. by *Sweden*; and on the W. by the *North Sea*, or *Atlantic*; and is about 1,060 miles from N. to S. and about 220 (where broadest) from E. to W.

Q. What

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Q. What is the *capital* of Norway ?

A. *Bergen*.

Q. How is *Bergen* situate ?

A. *Bergen* is in 60 degrees 20 minutes N. latitude, and 5 degrees 40 minutes E. longitude.

Q. What are the other chief towns ?

A. *Fredrickshal* and *Drontheim*.

Q. How are they situate ?

A. *Fredrickshal* is situate in 59 degrees N. latitude, and in 9 degrees 40 minutes E. longitude; and *Drontheim*, in 63 degrees 20 minutes N. latitude, and in 10 degrees E. longitude.

S W E D E N.

Q. How is *Sweden* situate ?

A. *Sweden* is the next most northern kingdom of Europe, and extends from 55 deg. 40 min. to 70 deg. 30 min. N. lat.

Q. How is *Sweden* bounded ?

A. It is bounded by Norway and the *Frozen Ocean* on the N. by the *Scaggerac Sea*, the *Sound* and the *Baltic* on the S. by the *White Sea* and the *Empire of Russia* on the E. and by the impassable mountains of Norway on the W. and is about 800 miles from N. to S. and 650 from E. to W.

Q. Under which of the denominations given to the several parts of the earth, do the kingdoms of Norway and Sweden properly come ?

A. Under that of a *peninsula*, as these kingdoms (which lie one within the other) are wholly surrounded by the *Frozen Ocean*, the *White Sea*, the *Atlantic*, the *Scaggerac*, the *Baltic*,

the *Gulph of Finland*, and the lakes of *Ladoga* and *Anega*; except at the Isthmus of *Oloneckoi*, which joins Sweden to the Empire of Russia on the east.

Q. What is the capital of Sweden?

A. *Stockholm*.

Q. How is *Stockholm* situate?

A. *Stockholm* is situate in 59 degrees 30 minutes N. latitude, and 18 degrees 10 minutes E. longitude.

Q. What are the other chief towns?

A. *Upsal*, in 59 degrees 40 minutes N. latitude, and 17 deg. 30 min. E. longitude; and *Gottenburg*, in 57 deg. 40 min. N. latitude, and 12 deg. E. longitude; with some others.

THE EMPIRE OF RUSSIA.

Q. What is the next most northern dominion in Europe?

A. *Russia*.

Q. How far N. does *Russia* extend?

A. This vast Empire lies between 47 and 70 degrees N. latitude, extends almost from the Frozen Ocean to the *Euxine* or *Black Sea*, from which it is divided only by Little Tartary and the Crimea, and contains more square miles than *Poland*, *Germany*, *France*, and *Spain* put together.

Q. How is *Russia* bounded?

A. It is bounded on the N. by the *Frozen Ocean*; by *Little Tartary*, the *Crimea*, and part of *Poland* on the S. by *Asiatick Russia* or *Siberia* on the E. and by *Sweden*, the *Baltic*, and another part of *Poland* on the W. being about 1,000 miles from N. to S. and 1,500 from E. to W.

Q. What

Q. What is the capital of *Russia* ?

A. *Moscow* was formerly the capital of the Russian Empire ; but *Petersburg*, built by Peter the Great, is now the seat of government.

Q. What are the situations of those cities ?

A. *Petersburg* is situate in 60 degrees N. latitude, and in 30 degrees E. longitude : *Moscow*, in 56 degrees N. latitude, and 38 degrees 20 minutes E. longitude.

Q. What are the other chief towns ?

A. *Archangel* on the coast of the White Sea in 65 degrees N. latitude, and 38 degrees 40 minutes E. longitude ; *Smolensko* on the river *Dniper*, (the ancient *Boristhenes*) in 55 degrees N. latitude, and 32 degrees 30 minutes E. longitude, with *Kiow* on the same river, in 50 degrees 40 minutes N. latitude ; and *Waronets* on the river *Don*, in 52 degrees 40 minutes N. latitude, and 40 degrees E. longitude ; and many others.

G R E A T B R I T A I N,

INCLUDING SCOTLAND AND IRELAND.

Q. How is *Great Britain* situate ?

A. *Great Britain* and *Ireland* are situate in the Atlantic Ocean, and are the most western parts of Europe ; they are in the middle (northern) latitudes, that is between 50 and 59 degrees N. and between 2 deg. E. and 10 deg. W. longitude.

Q. How is *Great Britain* bounded ?

A. It is bounded on the N. by the Northern Ocean ; by the English Channel on the S. by the German Ocean on the E. and

and by the Irish sea on the W. being about 660 miles from N. to S. and 350 (where broadest) from E. to W.

Q. How is *Ireland* bounded ?

A. It is bounded on the N. the S. and the W. by the Atlantic Ocean; and on the E. by the Irish sea, or St. George's Channel; and is about 300 miles from N. to S. and 170 from E. to W.

Q. What is the capital of Great Britain ?

A. *London*, situate in latitude, 51 degrees 30 minutes N.

Q. What are the other chief towns of Great Britain ?

A. *Bristol*, situate in 51 degrees 27 minutes N. latitude, and 2 degrees 40 minutes W. longitude : *Edinburgh*, the capital of *Scotland*, in 55 degrees 50 minutes N. latitude, and 3 degrees 10 minutes W. longitude ; with many others.

Q. What is the capital of Ireland ?

A. *Dublin*, situate in 53 degrees 20 minutes N. latitude, and 6 degrees 40 minutes W. longitude.

Q. What are the other chief towns ?

A. *Cork*, in 51 degrees 40 minutes N. latitude, and 8 degrees 30 minutes W. longitude ; with several others.

P O L A N D.

Q. What is the next most northern kingdom of Europe ?

A. *Poland*.

Q. How far N. does *Poland* extend ?

A. It extends from 47 to 57 degrees N. latitude.

Q. What are the boundaries of *Poland* ?

A. *Poland* is bounded on the N. by *Prussia*, *Russia*, and the *Baltic*; by *Hungary*, *Turkey*, and *Little Tartary* on the S. by *Russia*

Russia on the E. and by *Germany*, *Hungary* and *Scandinavia* on the W. being about 680 miles from N. to S. and 700 from E. to W.

Q. What is the capital of Poland ?

A. *Warsaw*.

Q. What is the situation of *Warsaw* ?

A. *Warsaw* is situate in 52 degrees 20 minutes N. latitude, and in 22 degrees E. longitude.

Q. What are the other chief towns ?

A. *Cracow*, heretofore the capital of Poland, situate in 50 degrees 20 minutes N. latitude, and in 20 degrees 40 minutes E. longitude : *Elbing*, in 54 degrees N. latitude, and in 20 degrees 20 minutes E. longitude : *Thorn*, in 54 degrees 20 minutes N. latitude, and 18 degrees 30 minutes E. longitude ; and *Grodno*, in 53 degrees 20 minutes N. latitude, and 20 degrees 10 minutes E. longitude ; with several others.

G E R M A N Y.

Q. What is the situation and extent of the *German Empire* ?

A. *Germany*, properly so called, is situate between 45 and 55 degrees N. latitude, and between 4 and 19 degrees E. longitude ; being about 500 miles from N. to S. and 600 from E. to W.

Q. What are the boundaries of *Germany* ?

A. *Germany* is bounded on the N. by the German Ocean, *Denmark*, and the *Baltic* ; by *Switzerland* and the *Alps* (which divide it from *Italy*) on the S. by *Poland* and *Hungary* on the E. and by *France* and the *Netherlands* on the W.

Q. How

Q. How is *Germany* divided ?

A. Into nine great or primary divisions, called the *North*, *South*, and *Middle Circles*. The *Northern Circles* are *Upper Saxony*, *Lower Saxony*, and *Westphalia*. The *Southern Circles* are *Austria*, *Bavaria*, and *Swabia*: and the *Middle Circles* are the *Upper Rhine*, the *Lower Rhine*, and *Franconia*.

Q. What is the capital of the German Empire ?

A. Vienna.

Q. How is *Vienna* situate ?

A. *Vienna* is situate in 48 degrees 20 minutes N. latitude, and in 16 degrees 40 minutes E. longitude.

Q. What are the other chief towns ?

A. The cities and towns of this great Empire are too numerous to have a place in this Epitome.

P R U S S I A.

Q. What is the situation and extent of the kingdom of *Prussia* ?

A. *Prussia proper*, is situate between 52 degrees 50 minutes, and 56 degrees N. latitude, and between 16 degrees 30 minutes, and 24 degrees E. longitude ; being about 170 miles from N. to S. and 250 from E. to W.

Q. How is the kingdom of *Prussia* bounded ?

A. It is bounded on the N. by the *Baltic*, *Samogitia*, and *Pomerania*; on the S. by *Poland* proper, and *Massovia*; on the E. by *Lituania*; and on the West by *Pomerania*.

Q. What is the capital of Prussia ?

A. Koningsberg.

Q. How

Q. How is *Koningsberg* situate?

A. It is situate in 55 degrees N. latitude, and 22 degrees E. longitude.

Q. What are the other chief towns?

A. *Elbing* in 54 degrees N. latitude, and 20 degrees 40 minutes E. longitude; *Culm* in 53 degrees 20 minutes, N. latitude, and 19 degrees 40 minutes, E. longitude, and some others.

B O H E M I A.

Q. What is the situation and extent of the kingdom of *Bohemia*.

A. *Bohemia proper*, is situate almost in the middle of Germany, between 47 degrees 30 minutes, and 51 degrees N. latitude, and between 12 degrees 30 minutes, and 17 degrees 20 minutes, E. longitude, being about 200 miles from N. to S. and 250 from E. to W.

Q. What are the boundaries of *Bohemia*?

A. It is bounded on the N. by *Lusatia*, and the *Electorate of Saxony*; by *Austria* and part of *Bavaria*, on the S. by *Silesia* and *Moravia* on the E. and by *Franconia*, and another part of *Bavaria* on the W.

Q. What is the capital of *Bohemia*?

A. *Prague*.

Q. How is *Prague* situate?

A. *Prague* is situate in 49 degrees 40 minutes N. latitude, and in 12 degrees E. longitude.

Q. What are the other chief towns?

D

A. There



A. There are but few others of particular note in Bohemia *proper*, and those of *Silesia*, *Moravia*, and *Franconia*, do not come within the intention of this abridgement.

H U N G A R Y.

Q. What is the situation and extent of *Hungary*?

A. *Hungary*, like Bohemia, has varied its extent, but in its present limitations, it lies between 45 and 49 degrees 30 minutes N. latitude, and between 17 and 27 degrees 20 minutes E. longitude, being about 235 miles from N. to S. and 240 from E. to W.

Q. What are the boundaries of *Hungary*?

A. *Hungary* is bounded on the N. by the *Carpathian mountains*, which divide it from *Poland* on that side; by the river *Drave* (which divides it from *Sclavonia*) by Turkey in Europe, the termination of the *Carpathian mountains*, and *Bulgaria*, on the S. by the middle part of this vast chain of mountains, which divides it from *Red Russia*, *Moldavia*, and *Walachia* on the E. and by *Austria*, *Moravia*, and *Stiria* on the W.

Q. What is the capital of the kingdom of *Hungary*?

A. *Presburg*.

Q. How is *Presburg* situate?

A. It is situate on the *Danube*, in 48 degrees 30 minutes N. latitude, and 18 degrees E. longitude.

Q. What are the other chief towns?

A. *Buda*, likewise on the *Danube*, in 47 degrees 20 minutes N. latitude, and 19 degrees 20 minutes E. longitude; with *Gran*, on the same river, and several others.

F R A N C E.

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F R A N C E.

Q. What is the situation and extent of the kingdom of France?

A. France is situate between 42, and 51 degrees N. latitude, and between 5 degrees W. and 8 degrees E. longitude, being 500 miles from N. to S. and 600 from E. to W.

Q. What are the boundaries of France?

A. France is bounded on the N. by the Netherlands, and the English Channel; by the *Mediterranean*, and the *Pyrenean* mountains, which divide it from Spain, on the S. by *Germany*, *Switzerland*, and *Italy*, on the E. and by the Bay of *Biscay* on the W.

Q. What is the capital of France?

A. Paris.

Q. How is Paris situate?

A. Paris is situate on the River *Seine*, in 48 degrees 40 minutes N. latitude, and in 2 degrees E. longitude.

Q. What are the other chief towns?

A. The chief towns are *Rheims* (where the kings of France are crowned), in 49 degrees 20 minutes N. latitude, and in 4 degrees 10 minutes E. longitude; *Lyons*, in 45 degrees 50 minutes N. latitude, and in 4 degrees 50 minutes E. longitude, and many others.

S P A I N.

Q. What is the situation and extent of the kingdom of Spain?

A. Spain is situate between 36 and 44 degrees N. latitude,

and between 10 degrees W. and 4 degrees 40 minutes E. longitude, being about 500 miles from N. to S. and 700 from E. to W.

Q. What are the boundaries of *Spain*?

A. *Spain* is bounded on the N. by *France*, and the Bay of Biscay; by the *Atlantic*, the Straits of *Gibraltar*, and the *Mediterranean* on the S. by another part of the *Mediterranean* on the E. and by another part of the *Atlantic* on the W.

Q. What is the capital of *Spain*?

A. Madrid.

Q. How is *Madrid* situate?

A. It is situate in 40 degrees 20 minutes N. latitude, and in 4 degrees 20 minutes W. longitude.

Q. What are the other chief towns?

A. They are too numerous to be recounted here.

P O R T U G A L.

Q. What is the situation and extent of *Portugal*?

A. *Portugal* is situate between 36 degrees 40 minutes, and 42 degrees, N. latitude, and between 6 and 9 degrees 30 minutes W. longitude, being about 300 miles from N. to S. and 100 from E. to W.

Q. What are the boundaries of *Portugal*?

A. It is bounded by *Galicia*, (a part of *Spain*) on the N. by the *Atlantic Ocean* on the S. by another part of *Spain* on the E. and by another part of the *Atlantic* on the W.

Q. What is the capital of *Portugal*?

A. Lisbon.

Q. How

Q. How is *Lisbon* situate?

A. *Lisbon* is situate in 39 degrees N. latitude, and in 8 degrees 40 minutes W. longitude.

Q. What are the other chief towns?

A. The principal are *Oporto*, in 41 degrees N. latitude, and 8 degrees W. longitude, with *Braga*, *Miranda*, *Coimbra*, and some others.

SARDINIA, WITH SAVOY AND PIEDMONT.

Q. What are the king of *Sardinia*'s dominions?

A. The Island of *Sardinia*, with the Dutchy of *Savoy*, and Principality of *Piedmont*, and some other parts of Italy.

Q. What is the situation of the Island of *Sardinia*?

A. *Sardinia* is situate in the Mediterranean sea, between 38 degrees 40 minutes, and 41 degrees 10 minutes N. latitude, and between 8 degrees 20 minutes, and 10 degrees, E. longitude, being about 170 miles from N. to S. and about 70 from E. to W.

Q. What is the situation of *Savoy* and *Piedmont*?

A. *Savoy* and *Piedmont*, lie N. and S. of each other, and are the most western parts of Italy, and bordering on France; the boundaries of *Savoy* and *Piedmont* join, and their extent lies between 43 degrees 30 minutes, and 46 degrees 20 minutes N. latitude, and between 6 and 8 degrees E. longitude, being about 170 miles from N. to S. and about 80 from E. to W.

Q. What is the capital of the Sardinian dominions?

A. *Turin* in *Piedmont* (the seat of government), in 44 deg. 40 min. N. latitude, and 7 deg. 40 min. E. longitude.

Q. What

Q. What are the other chief towns ?

A. Chambery the capital of Savoy, and some others.

N A P L E S A N D S I C I L Y,

COMMONLY CALLED THE TWO SICILIES.

Q. What is the situation and extent of the kingdom of *Naples* ?

A. *Naples* is situate between 37 degrees 40 minutes, and 42 degrees 50 minutes N. latitude, and between 14 and 18 deg. 40 min. E. longitude, being about 300 miles from N. W. to S. E. and generally about 90 miles from N. E. to S. W.

Q. What are the boundaries of the kingdom of *Naples* ?

A. *Naples* is bounded on the N. by the Pope's Patrimony, or the *Estate of the Church*, by the *Mediterranean* on the S. by the *Adriatic* or the *Gulph of Venice* on the E. and by another part of the *Mediterranean* on the W.

Q. What is the capital of the kingdom of *Naples* ?

A. The capital of the kingdom of *Naples* is the city so called, situate in latitude 40 degrees 40 minutes N. and in 14 degrees 30 minutes E. longitude.

Q. What are the other chief towns ?

A. The chief are *Benevento*, on the river *Voltorno*, with *Manfredonia* on the coast of the *Adriatic*, and some others.

Q. What is the situation and extent of the Island of *Sicily* ?

A. The Island of *Sicily* lies between 36 degrees 30 minutes, and 38 degrees 40 minutes N. latitude, and between 12 degrees 30 minutes, and 16 degrees 10 minutes E. longitude, being about 130 miles from N. to S. and 190 from E. to W.

Q. What

Q. What are the boundaries of this Island?

A. It is bounded on the N. the S. and the W. by the Mediterranean ; and by the Straits of *Messina*, which divide it from *Italy* on the E.

Q. What is the capital of the island of *Sicily*?

A. The capital is *Palermo*, situate on the northern coast of the west angle of the island, in latitude 38 degrees N. and in 13 degrees E. longitude.

Q. What are the other chief towns?

A. The other chief towns, are, the city of *Messina*, situate on the Strait of that name ; and the famous city of *Syracuse* on the eastern coast, and S. of the former.

T U R K E Y I N E U R O P E.

Q. What is the situation and extent of the empire of *Turkey* in Europe ?

A. Turkey in Europe is situate between 36, and 49 degrees N. latitude, and between 16 and 40 degrees E. longitude, being about 880 miles from N. to S. and (including Little Tartary) near 1,200 from E. to W.

Q. What are the boundaries of *Turkey* in Europe?

A. It is bounded on the N. by *Sclavonia*, *Hungary*, *Poland*, and *Russia*; by the Mediterranean on the S. by the *Archipelago*, the Straits of the *Dardanelles*, the Sea of *Marmora* the Thracian *Bosphorus*, the *Black Sea*, and the Sea of *Azoph* on the E. and by the *Austrian* and *Venetian* Territories, the Republick of *Ragusa* and the *Ionian* Sea (or another part of the Mediterranean), on the W.

Q. What

Q. What is the capital of Turkey in Europe?

A. *Constantinople*, situate in 41 degrees 30 minutes N. latitude, and 29 degrees 10 minutes E. longitude.

Q. What are the other chief towns?

A. *Adrianople* westward of the former, sometimes the residence of the Turkish emperor, with *Belgrade* on the Danube, and several others.

L E C T U R E III.

A DESCRIPTION OF THE ARTIFICIAL SPHERE.

THE artificial *Globe* is a *Sphere*, on which is accurately delineated a Map of the Earth, from the latest and best *Astronomical, Geographical, and Nautical, discoveries*.

On the surface of the globe are two points diametrically opposite to each other, called its *Poles*; a line which connects these two poles, and which passes through that point which is the Earth's centre, is called its *Axis*, on which it turns once every 24 hours, by which we have the vicissitude of day and night.

In using the *Terrestrial Globe*, we are to suppose ourselves standing on some part of its surface, and that its motion round its *Axis* represents to us the diurnal motion of the Earth, which is from W. to E. and causes the vicissitude of day and night, as above.

Several Circles are described on the surface of the *Globe*; such of those Circles whose *planes* pass through the centre of the

the Globe, are called the great Circles of the Sphere, which are all graduated into 360 degrees, the number contained in all Circles, great and small.

Those Circles, whose planes do not pass through the centre of the Globe, are called *lesser* Circles of the Sphere. Of the former there are six, viz. the *Equator*, the *Meridian*, the *Ecliptic*, the *Horizon*, and the *Solstitial* and *Equinoctial Colures*; of the latter there are four, viz. the Tropic of *Cancer*, the Tropic of *Capricorn*, and the *Arctic* and *Antarctic* Circles.

The Globe is suspended at its poles in a strong brass meridian, by which means it can be turned on its axis, to shew its diurnal motion. Along with the strong brass meridian, it has a thin brass semicircle moveable about the Poles, which is used as a *moveable meridian*; on which there is a small sliding Circle, meant as the *sensible Horizon* of any particular place to which it is set: it is also divided into a few points of the Compas.

THE EQUATOR.

The first, or principal of the great Circles of the Sphere, is the *Equator*; this great Circle divides the Earth into two equal parts, called the *Northern* and *Southern Hemispheres*, being 90 degrees distant from either Pole; from which circumstance of dividing the Earth into two equal parts, it is called the *Equator*; and as the days and nights are of equal length, when the Sun is in those points of the Ecliptic *Aries* ♈ and *Libra* ♎, where it crosses it, it is thence also called the *Equinoctial Line*.

E

As

As the Earth's *axis* is perpendicular to the *plane* of the *Equator*, which, in passing through the Earth's centre, from Pole to Pole, divides the Equator at right angles; the axis of the Earth is therefore the axis of the Equator.

On this Globe the Equator is graduated into 360 degrees, by an upper and a lower line of figures; the first, from the meridian of London eastward; and the second (or lower line), from the same meridian westward.

Close under the degrees of the Equator, is a circle of *hours* and *minutes*; the hours increase westward from the meridian of London to 12, and begin again, increasing to the same. The *Equator*, it is to be observed, is graduated into degrees and minutes on a triple line; the upper part of which contains the degrees, and the lower part has the space of each degree divided into three parts, each containing 20 minutes; the smallness of the scale not admitting a further subdivision. In all positions of the Globe, except that of a parallel sphere, the plane of the *Equator* cuts the true E. and W. points of the Horizon, or broad paper circle.

THE ECLIPATIC.

The next great Circle of the Sphere is the *Ecliptic*; this Circle crosses the Equator in two opposite points, in the beginning of *Aries* ♈ and *Libra* ♎, as was mentioned above, making an angle with it of $23\frac{1}{2}$ degrees; and this angle is called the *Obliguity* of the Ecliptic.

This great Circle, like the Equator, is graduated into 360 degrees; and the upper part of the line is divided into twelve parts,

parts, marked with the several signs of the zodiac (through the midst of which, in the *Celestial Sphere* the Ecliptic passes) each of which signs contains 30 degrees, and are numbered accordingly. The Zodiac, which contains these 12 signs, is a broad zone or girdle encompassing the heavens, and in breadth extending 8 degrees on each side of the Ecliptic ; it is called the Zodiac from the Greek word *Zoos*, which signifies a *living creature*, as each sign is made to represent some animal ; their *names* and the *characters* by which they are distinguished are as follow, viz. Aries ♈ the *Ram*; Taurus ♉ the *Bull*; Gemini ♊ the *Twins*; Cancer ♋ the *Crab*; Leo ♌ the *Lion*; Virgo ♍ the *Virgin*; Libra ♎ the *Balance*; Scorpio ♏ the *Scorpion*; Sagittarius ♐ the *Bow-man*; Capricornus ♑ the *Goat*; Aquarius ♒ the *Water-bearer*; Pisces ♓ the *Fishes*.

These 12 Signs are thus represented on the Terrestrial Globe, tho' they and the *Ecliptic* do not properly belong to it ; but are transferred from the Celestial Sphere ; because they are of use in some particular cases.

The *Sun's* apparent place, is in this circle (the Ecliptic). He advances therein at a main rate, nearly one degree every natural day, or 24 hours ; and seems to move round the whole circle of the heavens, or through all the signs, in a tropical year ; and those places where this circle crosses the Equator in *Aries* ♈ and *Libra* ♎, are called the *Equinoctial Points*, for the reasons given in describing the Equator.

By the Ecliptic thus crossing the *Equinoctial Line* in the two opposite points above-mentioned, half of it is necessarily on the N. side of the Equator, and half on the S. side ; and of

those two points, the first (which is in *Aries*) is called the *Vernal Equinox*; and the second, which is in *Libra*, is called the *Autumnal Equinox*, the day and night (when the Sun is in either of these points) being of *equal length* to all the inhabitants of the Earth.

When the Sun is in that point of the *Ecliptic* which touches the Tropic of *Cancer*, it is called the *Summer Solstice*, from the ancient supposition that the Sun stood still at the sign *Cancer*, before he began to return from that most distant point of the *Ecliptic*, on the N. side; and when he is in that part which touches the Tropic of *Capricorn*, it is called the *Winter Solstice*, as he is then in the farthest point of the *Ecliptic* on the S. side; for, as when the Sun is in *Cancer*, he makes it *summer* to all the inhabitants of the *Northern Hemisphere*, and *winter* to all those of the *Southern*; so when he is in the sign *Capricorn*, at the Tropic so called, he makes it *summer* to all the inhabitants of the *Southern Hemisphere*, and *winter* to all those of the *Northern*.

THE STRONG BRASS MERIDIAN.

The Artificial Globe is suspended at its poles in a strong Brass *Meridian*, by which means it can be turned on its axis, to shew the diurnal motion of the Earth: this Brass *Meridian* moves in two opposite *receptacles* in the broad paper circle, or *Horizon*; one side of this Brass *Meridian* is graduated into four quadrants, of 90 degrees each; the numbers on two of these quadrants, increase from the *Equator* to the *Poles*; the numbers on the other two, increase from the *Poles* to the *Equator*.

Equator. The first are to shew the latitude of places, or their distance from the Equator. The second are to rectify the Globe to the latitude of any place. It is called the *strong Brass Meridian*, first, because there is a *flexible Brass Meridian*, which is *moveable*, and distinguished from it on *both* these accounts; and next, because the Sun's centre is perpendicular to all places under its graduated side at noon.

The graduated side of this strong Brass Meridian faces the W. according to the real motion of the Earth, which is from W. to E. both with regard to its diurnal motion on its axis, and its progress in the plane of the ecliptic round the Sun: On the back part of this strong Brazen Meridian, and on each side of the North Pole are also graduated 2 concentric spaces, containing a kalendar of the days and months of the year; the use of which will be shewn in the 10th Problem.

Besides this strong Brass Meridian, there is the thin flexible Meridian above-mentioned; this moves about the Poles, and is only simicircular, and used as a moveable Meridian: there is also fixed on it a sliding circle meant as a *sensible Horizon* of any particular place to which it is set; and it is divided into a few points of the mariner's compass, as already mentioned; along with these, there is also the Quadrant of Altitude, which being screwed to the highest point of the Brazen Meridian, shews the distance of one place from another, in degrees and minutes.

THE HORIZON.

The *Broad Paper Circle*, or *Horizon*, contains four concentric circles, or spaces; the innermost, or that nearest the globe, is

is divided into 360 degrees, and numbered into four quadrants (or quarters of a circle) these degrees begin at the E. and W. points of the Horizon, and proceed each way to 90 degrees, which terminate at the N. and S. poles, and these four points are called the four *cardinal* points of the Horizon.

The *second* circular space contains, at equal distances, the thirty-two points of the mariner's compass.

The *third* circular space contains a *kalender* of the days and months in the year, each day in this *kalender* is divided into four parts, expressing the four *cardinal* points of the day, according to the Julian reckoning (or four parts of six hours each); by which means, the Sun's place in the ecliptic is very nearly obtained, for the common years after Bissextile, and the *intercalary* day may be inserted without confusion.

The *fourth* circular space, is divided into 12 equal parts, representing the 12 signs of the zodiac; and these into 30 degrees each, between which are the names and characters of the 12 signs above-mentioned. The use of these two last-mentioned circles, is shewn in the eleventh Problem.

A further use of this Broad Paper Circle, is to distinguish the points of the Horizon; in this case it represents the rational Horizon, which is an imaginary great circle, dividing the Earth into two equal parts, called the *visible* and *invisible* Hemispheres.

The *rational* Horizon, is supposed to be parallel to a *lesser* circle, called the *sensible* Horizon, whose plane touches the surface of the globe at the place where the spectator stands, and terminates his view all around; *which view*, is more extended the higher the observer is placed.

THE TROPICS.

On each side of the Equator, are drawn 23 parallels, at the distance of one degree, or 60 minutes from each other; and at the distance of $\frac{1}{2}$ a degree, or 30 minutes more, are the Tropics mentioned above.

These two Tropics are necessarily *lesser* circles of the sphere; for as the plane of each Tropic passes $23\frac{1}{2}$ degrees wide of the Earth's centre, *neither* can divide the Earth into two *equal* parts, and consequently each must be *less* than the *Equator* or a *Great Circle*.

The Tropic of *Cancer* is on the N. side of the equator, and the tropic of *Capricorn* on the S. side.

The northern Tropic, has the additional name of *Cancer*, because it touches the ecliptic in that sign; and the southern Tropic is named from *Capricorn*, because it touches the ecliptic in the farthest point S. of the equator, in the sign so called.

The polar circles are two other lesser circles of the sphere, and each $23\frac{1}{2}$ degrees from its respective pole; that at the N. pole, is called the *Arctic Circle*, that at the S. pole the *Antarctic Circle*.

The *Tropics* and the *Polar Circles* being parallel to the equator, their planes intersect the Earth's axis at right angles, and consequently the Earth's axis is also the axis of the two Tropics, and of the polar circles.

LECTURE IV.

THE USE OF THE ARTIFICIAL SPHERE.

IF an accurate map of the Earth be delineated on a *globe* or *Sphere*, the surface of such globe, will be a true representation of the surface of the Earth, even in the most apparent *doubtful* respect: for the highest mountains known to us, are no more an exception to the Earth's *roundness* or *smoothness*, than a few grains of fine sand would be to the roundness and evenness of an artificial sphere: for as the Earth is (in round numbers) 8,000 miles in diameter, and the highest mountain upon it (according to the most authentic accounts), is not three miles *perpendicular* height; a grain of common writing-sand, whose diameter is but the *hundred and fortieth part* of an *inch*, is higher in proportion to an *eighteen-inch* globe, than a mountain three miles high would be in proportion to our Earth.

That the Earth is round, or spherical like this globe, appears from several demonstrative reasons: *first*, because its shadow on the Moon in an *eclipse*, is round, whatever side of the Earth is turned towards her at that time: *secondly*, because those navigators, who have began their course to the E. and continued to sail in that direction, have come round to the point from which they first set out: *thirdly*, from our prospect being the farther extended all round us, when we are placed on an eminence, than when we stand on a plain: and *fourthly*, because we see the masts of a ship at sea, when at a great distance, before we see her *bulk*, the latter being hid by the convexity of the water.

The

The Earth which this *Artificial Sphere* represents, has an attractive power, by which all terrestrial bodies are drawn to her surface; where they would always naturally remain, unless removed by some degree of force or violence. This is evident from the descent of all bodies in lines perpendicular to the Earth's surface, at those places where they fall, even when thrown off or projected from the Earth, on opposite, or contrary sides: and consequently, in opposite directions. So that the Earth may be compared to a great magnet, on which filings of steel are thrown, which are attracted by it, and adhere equally to its surface on all sides: hence it is, that all terrestrial bodies being thus arrested by the Earth's *magnetism*, stand equally secure, and can no more fall off from any one part of the Earth, than from another.

The Heavens surround the whole Earth, and when we say *up* or *down*, we must understand those expressions only as *relative* terms, which have no meaning but with regard to ourselves; for *no point*, either in the Heavens, or on the surface of the Earth, is either *above* or *below*, but with respect to us who live upon the Earth; for let us be upon what part of the Earth we may, we stand always with our feet perpendicular to the Earth's centre, and our heads to the sky; and therefore, in the ordinary modes of speech, we say, it is up towards the sky, and down towards the Earth; whereas, the sky, which is over the heads of the natives of *New Zealand*, or that part of the Earth which is opposite to that which we inhabit, is *under our feet*, and the sky which is over *our heads* is *under their feet*; and it is the same with all the *opposite* inhabitants of the globe, as they are all *antipodes* to each other.

The great Circles of the Sphere, having made a part of the preceding Lecture, it remains only to add a few further particulars with regard to the sensible *Horizon*, the *Equator* and the *Meridian*. The plane of the sensible Horizon divides the *heavens* into two hemispheres; we can see half the heavens from any part of the Earth's surface, on account of their great distance, but the *other half* is hid by the convexity of the Earth.

On this globe the *Equator*, as it truly is the hour circle, so it is here used for that purpose, instead of the common hour circle of other globes at the pole.

Meridians are great circles of the Sphere, as shewn above; there are 24 of those Meridians described on this globe, all intersecting the equator at *right angles*, and each other *at the poles*: they are also *hour circles*, being 15 degrees from each other; so many degrees upon the equator being equal to one hour of time, and every single degree equal to 4 minutes.

There are infinite meridians; because the Sun's centre must be perpendicular to any point of the Earth's surface (which is its meridian) before it can become perpendicular to the next point, which is ever so little to the westward of the former.

All those great Circles which pass through the poles are meridians to those places of the globe through which they pass; and being perpendicular to the plane of the Equator, that is, dividing it at right angles, they are called *secondaries* to it.

POSITIONS OF THE TERRESTRIAL SPHERE.

There are three positions of the Artificial Terrestrial Sphere ; viz. a *Parallel Sphere*, a *Right Sphere*, and an *Oblique Sphere*.

The *Parallel Sphere*, is that position of the globe, in which the poles are in the *zenith* and *nadir*; the *equator* and the *rational horizon* coincide, and the axis of the sphere is at right angles with both, and consequently all those circles which are *parallel to the equator*, are also parallel to the horizon.

The inhabitants of this sphere (if any there be), must live upon the two terrestrial poles, and will have but one day, and one night each throughout the year; that is, as soon as the Sun leaves the equinoctial point of the ecliptic, either to the *north* or *south* side of the Equator, it will be day to the inhabitants of the *pole* in that hemisphere he approaches, until he crosses the opposite equinoctial point, six months after, and goes to the other side of the Equator; the inhabitants of which pole, will have day for six months, and those he left will have night for the same length of time.

The moon, in this position of the sphere, during *half* her course, (that is for fourteen days and an half), will never rise; and during the other half will never set: the *sun*, *moon*, and such stars as are visible to the polar inhabitants, describe circles always parallel to their horizon.

A R I G H T S P H E R E.

The position of the globe, which renders it a Right Sphere, is that in which the inhabitants have both the poles in their *horizon*; as the *celestial equator* passes through their *zenith*

and *nadir*; and all circles parallel to the equinoctial, are *perpendicular* to the horizon.

The inhabitants of a *right Sphere*, live upon the *terrestrial equator*, consequently all heavenly bodies will rise *perpendicular* to them, or in a *right angle* with their horizon; and their days and nights will be of an equal length throughout the year.

A N O B L I Q U E S P H E R E.

In this position of the Sphere, one of its poles is *above* the horizon, and the other *below* it; the Equator in all cases of this Sphere, is half above and half below the horizon, and the Equator and all its parallel circles cut the horizon obliquely.

That *arch* of any parallel of latitude in an *oblique Sphere*, which is above the horizon, is called the *diurnal arch*; and the part which is below the horizon, is called the *nocturnal arch*.

These *arches*, with respect to the Sun's apparent motion, determine the different length of the days and nights.

The inhabitants of this Sphere, are those who live in all parts of the globe, except those who inhabit the *poles*, and the *equator*.

P R O B L E M S

WROUGHT ON THE TERRESTRIAL GLOBE.

IN working the several Problems on this Globe, it is intended (by the *magnetic needle* and the *compass box*, fixed to the pillar and claw which supports the Globe), that it should be placed with its poles in the same direction with those of the heavens;

heavens; but this can very seldom be done, with convenience, and it is fortunate that it is not always necessary, as the light in very few apartments will admit of it.

In working the following Problems, it is only necessary to observe these directions; viz. To place the Globe, so that the graduated side of the strong brass meridian may have the light full upon it; place yourself at the S. side of the horizon or broad paper circle, with the N. point opposite to you, and in such a manner, as to command the degrees and minutes on the strong brazen meridian; and to prevent injury to the Globe, (as much handling is apt to fally and obscure the figures, &c.) it will be best to work all Problems, &c. with gloves on.

P R O B L E M I.

To find the Latitude of any place :

As the Latitude of any place, is its distance from the equator towards either pole; if the place be on the N. side of the equator, it is in N. latitude; if on the S. side, it is in S. latitude; therefore,

Bring the place to the graduated side of the strong brass meridian, and the degree it cuts, is the distance of the place from the equator, which is its latitude.

P R O B L E M II.

To rectify the Globe to the Latitude of any place :

If the place be in N. latitude, elevate the N. pole, (if in S. latitude, the S. pole) until the degree and minute of the given latitude, reckoned on the strong brass meridian, is cut by the plane of the horizon, or broad paper circle, which circle will then

then represent the rational horizon of that place : thus, as London is in latitude 51 deg. 30 min. N. latitude, elevate the N. pole till 51 degrees 30 minutes, on that part of the strong brass meridian which is *under* the pole, are cut by the broad paper circle or horizon, and the Globe is rectified to the latitude of that place.

P R O B L E M III.

To find the Longitude of any place :

As the Longitude of any place is that point or degree on the equator which is crossed by the *meridian* of such place, reckoned from a first meridian ; therefore the first meridian on this Globe, being the meridian of London, bring the proposed place to the strong brass meridian, and the degree and minute of the equator, which is cut by it, is the longitude of the place, reckoned from the meridian of London.

P R O B L E M IV.

To find out all those places which have the same Latitude with any other place :

Suppose the given place to be London ; turn the Globe round, and all those places which pass under the same degree and minute, have the same latitude.

P R O B L E M V.

To find the difference of Latitude between any two places :

Suppose the places whose difference of Latitude is sought to be *London* and *Rome*; find the Latitude of each, by Problem I. and the difference is the answer.

P R O B L E M

P R O B L E M VI.

At any given time of the day, at the place where you are, to find the hour at any place proposed :

Bring the place proposed, to the graduated side of the strong brass meridian, and set the horary index to the *given time*; then turn the globe till the place where you are is under the brass meridian, and the index will point to the hour and minute required.

P R O B L E M VII.

The Latitude and Longitude of any place being known, to find that place upon the Globe:

The Latitude of Smyrna (for example) is 38 degrees 30 minutes, and the Longitude 27 degrees 30 minutes E. of London; therefore,

Bring the given Longitude on the equator, to the graduated side of the strong brass meridian, and under 38 degrees 30 minutes N. latitude, you will find the place required.

P R O B L E M VIII.

To find what places have the Sun upon their *meridian*, or have mid-day, at any given hour, in any place proposed:

First, it is to be remembered, that as the diurnal motion of the Earth on her axis is from *west* to *east*, all places ever so little to the eastward of any *other place*, must necessarily pass by the Sun, before the latter can arrive at it; therefore,

As the first meridian on this Globe passes through London, if London should be the place proposed, bring the given hour on

on the equator to the graduated side of the strong brass meridian, and all those places which lie directly under it, have the Sun upon their meridian (or have mid-day) when it is the given hour at London: thus,

Let the hour proposed be 9 o'clock in the morning, at London; bring 9 o'clock *on the equator*, to the *strong brass meridian*, and all those places which will then be under it, have *noon*, or the Sun upon their meridian, when it is 9 o'clock in the morning at London.

But if the place proposed, is one through which the first meridian *does not pass*, as the city of *Constantinople* (for example), then the city of Constantinople being the place proposed, must be brought to the strong brass meridian, and the index set to that 12 which is uppermost, or above the horizon; then turn the **Globe**, till the index points to the given hour, and the strong brass meridian will pass over those places which have the Sun upon their meridian, when it is the given time at Constantinople.

If the given time be in the *morning*, turn the **Globe westward**, if in the *evening*, turn it *eastward*.

P R O B L E M IX.

To find out what hour it is at any place *proposed* when it is noon at any given place :

Bring the proposed place to the graduated side of the strong brass meridian, and set the *horary index* to that 12 which is most elevated, then turning the **Globe**, bring the *given place* to the brass meridian, and the index will shew the hour required. If
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the place proposed be to the *eastward* of the given place, the answer will be afternoon; but if to the *westward*, it will be forenoon.

Thus: if the *given place* be London (at 12 o'clock), it is 50 minutes after one at *Smyrna*; 40 minutes after 7 in the evening at *Pekin* in China, and 55 minutes after 6 in the morning at *Port-Royal*, in Jamaica.

N. B. The index must be set according to the directions of the Problem, for each place separately.

P R O B L E M X.

To rectify the Globe, so that the enlightened half of the earth's surface may be above the broad paper circle, for any time of the year, the Sun being supposed to be in the zenith or meridian:

On the back of the strong brazen meridian (or on the eastern side), on each side of the N. pole, are graduated two concentric spaces, which contain a kalendar of the *months* and *days* of the year.

At the time of the current year (or of that year you are in), bring the day of the month in the above kalendar to coincide with the broad paper circle, and the Globe is rectified.

When the Globe is thus rectified, that degree and minute upon the *graduated* side of the strong brafs meridian, (that is, on the *west side*) which is cut by the plane of the broad paper circle, is the distance of the Sun's light on the earth's disk, or *upper side*; and likewise that of the shade or darkness, below

the aforesaid plane of the broad paper circle, being the boundary between the enlightened, and dark sides of the earth, and forming what is called the *Circle of Illumination*; which circle is equal to the Sun's *declination* for that day; it is also equal to the latitude counted from the equator; that is, whatever number of degrees and minutes can be reckoned from the pole to the broad paper circle, the same number counted from the equator, is the latitude of all those places to which the Sun is vertical at noon. This point likewise, on the brass meridian, represents the central *solar ray*, which describes the parallel of that day.

If the Globe thus rectified be turned from west to east, all those places which come up to the western edge of the broad paper circle, are passing out of the darkness into light, or the Sun appears then rising to the inhabitants of those places; and at the *eastern edge*, all those places which cut the broad paper circle are passing out of the light into the darkness; or the inhabitants will see the Sun then setting; and the graduated side of the strong brass meridian, at the same time shews all those places, which have mid-day, or the Sun upon their meridian at those times.

Bring any particular place to the graduated side of the strong brazen *meridian*, and set the index to that 12 which is uppermost; then turn the Globe westward, till the place is cut by the broad paper circle, and the index will point to the hour of sun-rise, at that place; and then turning it eastward, till the place is cut by the broad paper circle in like manner, and the index will shew the hour of sun-set; and by this means, counting

ing the *hours* as they rise at the western edge of the broad paper circle, until the place is cut, or descending at the eastern edge, you have the length of the day also.

N. B. If the place be under the *first* meridian, (or the *other* opposite to it) marked 12, then the strong brazen meridian *is itself* the *index*.

In finding the length of the day, subtract the number of hours which rise, as before mentioned, from 24 (the number of hours in the day and night taken together), and it gives the length of the night also at that time.

There are two *astronomical* terms necessary to be explained in this place; viz. the Sun's *declination*, and the Sun's *amplitude*; the former, is the Sun's distance in the ecliptic from the equator, *north*, or *south*; and is the same with what we call *latitude*, when places of the earth are mentioned; so what is north or south latitude, with regard to any part of the earth, is north or south *declination*, when we speak of the Sun.

Amplitude, means an arch (or part) of the *horizon*, intercepted between the true E. and W. points thereof, and the Sun's *centre* at rising or setting.

N. B. The *true* east, and west points of the horizon, are those points which are 90 degrees from either pole.

P R O B L E M XI.

The third circular space in the horizon or broad paper circle, as was mentioned in the first Lecture or description of this Globe, contains a *kalender* of the days and months in the year; and each

day as there mentioned, divided into four parts. The fourth circular space is divided into 12 equal parts, representing the 12 signs of the zodiac, and those into 30 degrees each; by these two circles, the Sun's place in the ecliptic is very nearly obtained, thus:

If it be bissextile, those divisions must be taken three-quarters of a day *backward*, which is the day of the month from the 1st of January, to the 28th of February inclusive, and the intercalary day is three-fourths of a day to the left hand, from the first of March; and the first of March itself is one-quarter of a day forward from the division marked 1, and so for every day in the remaining part of the leap-year, against each of which is the Sun's place in the ecliptic; and thus the intercalary day is easily introduced into the kalendar every fourth year, and the Sun's place found.

If it be the first year after *bissextile*, then the divisions, as marked, are the respective days for each month of that year at noon, under which, in the circle of the 12 signs, is the Sun's place.

If it be the second year after *bissextile*, the first quarter of a day *backward*, or to the left hand, is the day of the month for that year, against which, as before, is the Sun's place among the signs.

If it be the third year after *bissextile*, half a day backward, is the day of the month for that year, under which is the Sun's place.

In any of those cases, when you have found the Sun's place
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on the broad paper circle, then go to the ecliptic on the **Globe**, and in the same sign, the same degree and minute, is the Sun's place in the ecliptic for that day.

P R O B L E M XII.

To find all those places *within the polar circles*, on which the Sun begins to shine; the time he shines constantly; when he begins to disappear; the length of his absence; and the first and last day of his appearance to those inhabitants; the day of the month, or latitude of the place being given:

Bring the given day of the month, on the back (or eastern side), of the strong brass meridian, to the plane of the broad paper circle; the Sun is just then beginning to appear to the inhabitants of all those places which are in that parallel of latitude, which coincides with the edge of the broad paper circle (*under the pole and within the polar circle*); and will for several days seem to skim all around, and but a little above the horizon, in every part of which he will appear in his progress, seeming to move from that part in which he was first seen, till he arrives at the same point of the horizon again.—It may not be altogether improper in this place to observe, that the inhabitants of *either pole* (if any) have but *one* point in their *compass*; namely, the *south* to the inhabitants of the north pole; and the *north* to the inhabitants of the south pole: for whatever wind blows to the polar inhabitants, must blow from the opposite pole.

If the latitude (*within the polar circle*) be given, elevate the pole

pole to that latitude, and on the back of the strong brass meridian, you obtain the day of the month on which the Sun begins to shine to all the inhabitants of that latitude, within that polar circle, to which the Sun is approaching ; and on which he begins to disappear to all the inhabitants of that latitude within the opposite polar circle, from which the Sun is receding.

As the two concentric spaces on the back (or east side) of the strong brass meridian, together with the kalendar, are also graduated to shew the opposite days of the year, at 180 degrees distance ; when the given day is brought to coincide with the broad paper circle, it shews when the Sun begins to shine on that parallel ; that is, the first day of its appearance above the horizon of that parallel ; and the plane of the same broad paper circle, cuts the day of the month on the opposite concentric space, when the Sun begins to disappear to those inhabitants : thus, the length of the longest day is found, by reckoning the number of days between the two opposite days obtained as above ; and their difference from 365 days, gives the length of their longest night in that latitude.

P R O B L E M XIII.

To find the length of any day in the year, in any latitude :

Elevate the pole to the latitude of the place, and find the Sun's place in the ecliptic for the given day ; bring the Sun's place to the graduated side of the strong brass meridian, and set the horary index to that 12 which is most elevated ; then turn the Globe till the Sun's place in the ecliptic coincides with the

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the *eastern* edge of the broad paper circle, and the index will point to the hour of sun-rising; then turn it to the western side, and you find the hour of sun-setting.

Double the time of sun-setting, and you have the length of the day; and by doubling the time of sun-rising, you have the length of the night: add both totals together, and if they make 24 it is right; if *more*, or *less*, you have not worked the Problem with exactness.

F I N I S.

